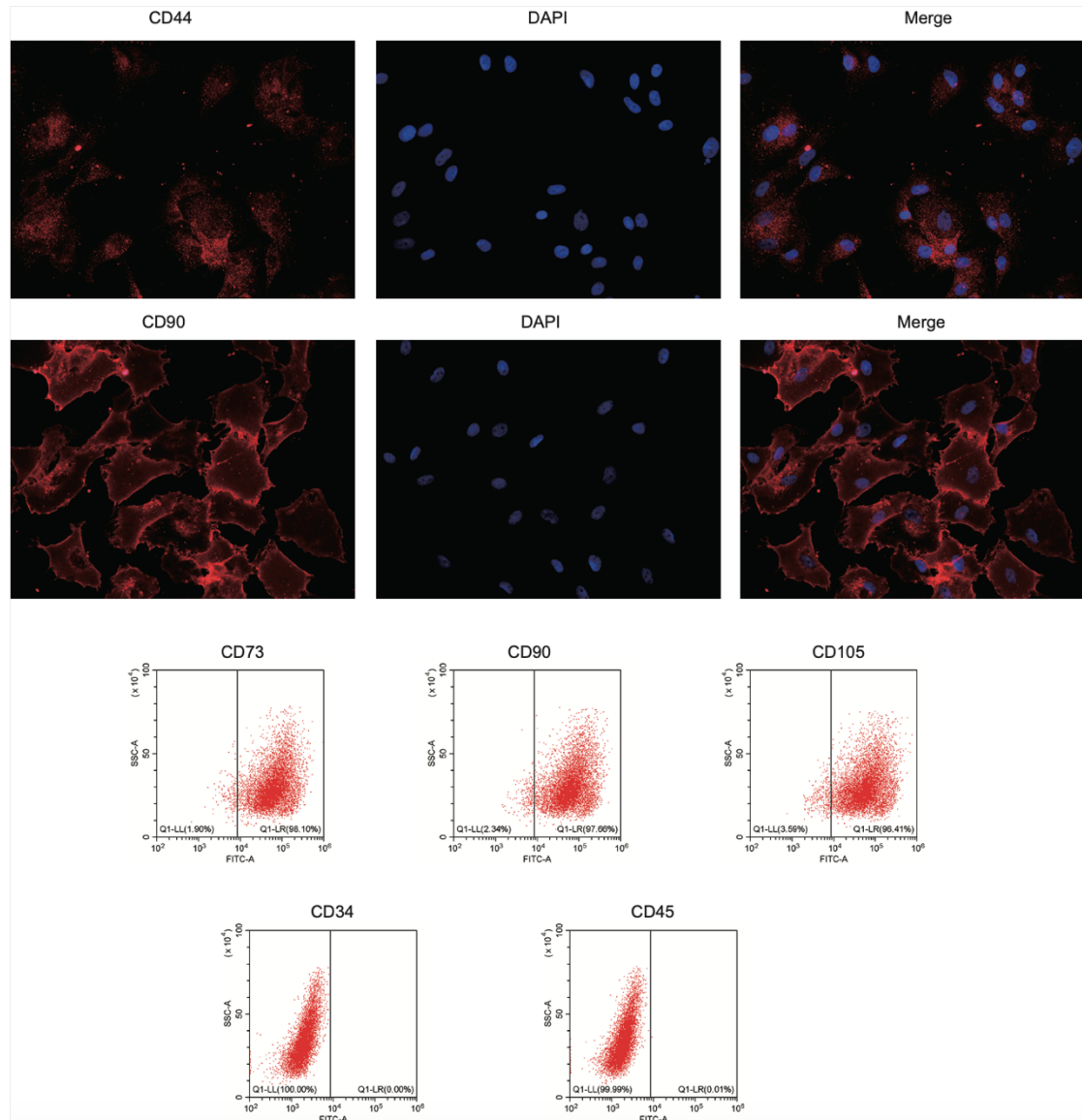# Supplemental Information

MSC-Derived Exosomes Protect Vertebral

Endplate Chondrocytes against Apoptosis

and Calcification via the miR-31-5p/ATF6 Axis

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Figure S1

Figure S1. Analysis of expression patterns of CD44, CD105, CD73, and CD90, and deficiency of

CD45 and CD34 surface molecules on MSCs using Immunofluorescence or flow cytometry.

Figure S2
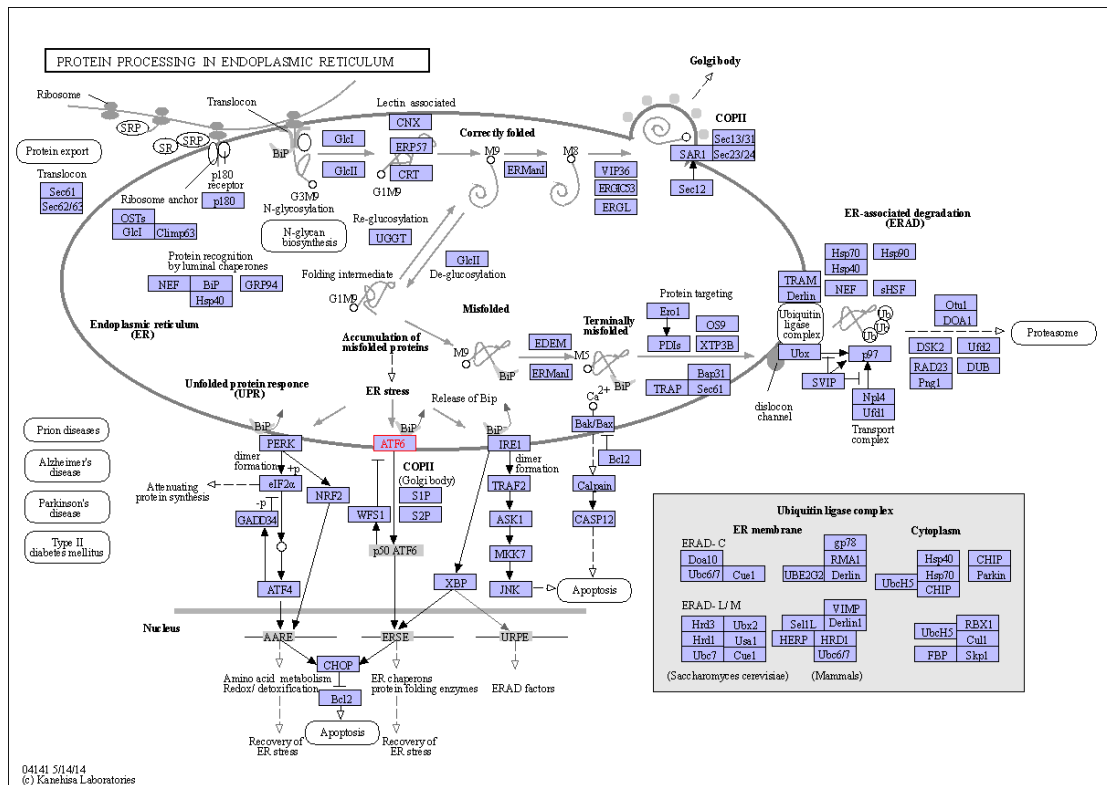
Figure S2. KEGG pathway showed that the direct effect of ATF6 was ER stress activation and

related apoptosis pathway.

Table S1. MSCs and Endplate donors used for this study.

Donor ID	Sex	Age	Surgery Site	Site of vertebral body for MSCs	Site of intervertebral disc for EPCs
#1	Female	19	C4/5, C5/6		C5/6
#2	Male	27	C4/5, C5/6, C6/7		C5/6
#3	Male	25	C4/5, C5/6, C6/7		C5/6
#4	Male	28	C4/5, C5/6		C4/5
#5	Male	20	C4/5, C5/6, C6/7		C4/5
#6	Male	23	C4/5, C5/6		C4/5
#7	Male	21	C4/5, C5/6		C4/5
#8	Male	21	C4/5, C5/6, C6/7		C4/5
#9	Female	45	C4/5, C5, C5/6	C5	C4/5
#10	Female	53	C4/5, C5,	C5	C5/6

			C5/6		
#11	Male	49	C3/4, C4, C4/5	C4	C4/5
#12	Female	48	C4/5, C5/6		C4/5
#13	Male	49	C4/5, C5, C5/6	C5	C4/5
#14	Male	47	C3/4, C4, C4/5	C4	C4/5
#15	Female	47	C4/5, C5/6		C4/5
#16	Female	59	C4/5, C5/6		C4/5

MSCs, mesenchymal stem cells; EPCs, Endplate Chondrocytes; C, cervical vertebral body;

Table S2. Sequence used in this study.

	Sequences
U6 Forward	5'-CTCGCTTCGGCAGCACA-3'
U6 Reversed	5'-ACGCTTCACGAATTTGCGT-3'
miR-31-5p Forward	5'-CGGCGGAGGCAAGATGCTGGCA-3'
miR-31-5p Reversed	5'-CAACTGGTGTCGTGGAGTCGG-3'
agomiR-31-5p	AGGCAAGAUGCUGGCAUAGCU
agomiR-NC	UUUGUACUACACAAAAGUACU
antagomiR-31-5p	CAGCUAUGCCAGCAUCUUGCCU
Antagomir-NC	AAACAUGAUGUGUUUUCAUGAC
ATF6-siRNA Sense	AGTCGCCTTTTAGTCCGGTTC
ATF6-siRNA Antisense	CTGACTCCCAAGGCATCAAAT
Scramble siRNA Sense	ACCACAGTCCATGCCATCAC
Scramble siRNA Antisense	TCCACCACCCTGTTGCTGTA